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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/919,115      | 08/01/2001  | Wolfgang Hoenlein    | 32226.11            | 3454             |

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EXAMINER

LISH, PETER J

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

1754

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/919,115

Applicant(s)

HOENLEIN ET AL.

Examiner

Peter J. Lish

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 November 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 36-53 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 36-53 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments filed 11/2/05 have been fully considered but they are not persuasive. The applicant argues that Shibuta fails to teach the oxidation of only the outer wall of the multi-walled carbon nanotube. However, as stated in the previous office action, while it is not explicitly stated that only the outer wall of the nanotube is substantially oxidized, it is equivalently stated that the treatment results in the surface of the nanotube being modified with functional groups. Alternatively, it is expected that the outer wall of the nanotube be substantially oxidized because the treatment is performed identically to that of the applicant. Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to the applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See *In re Best*, 195 USPQ 430.

The applicant additionally argues that Shibuta fails to teach that covalent bonding of the nanotube to the substrate due to the oxidation of the nanotube surface. However, it is expected that this covalent bonding occur, because no difference is seen between the process of Shibuta and that of the applicant. The oxidized nanotubes of Shibuta are dispersed in water and coated onto a glass substrate in example 1. This same process is taught by the applicants to result in covalent bonding of the nanotubes to the substrate because substrates based on silicon, for example glass, are known to bear hydroxyl groups which will bond with the carboxyl groups on the surface of the nanotubes. Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the

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burden of proof is shifted to the applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See *In re Best*, 195 USPQ 430.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 45-53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 45-48, 50, and 53, the step of “ensuring the substrate is bearing chemically reactive groups” is indefinite as it is not seen to be a positive process step and is unclear as to what action is required. Regarding claims 49-53, the step of “separating off the multiwall carbon nanotubes” is indefinite as it is unclear as to what the nanotube is separated from (solution, impurities, catalyst, etc.).

***Claim Rejections - 35 USC § 102/103***

Claims 36, 40-43, 45-46, and 49-51 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Shibuta (USPN 5,853,877).

Shibuta discloses the treatment of carbon fibrils, or multi-walled carbon nanotubes, with a particular solution comprising a strong acid containing sulfur in addition to an oxidizing agent

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(column 4, lines 29-35). The strong acid is preferably sulfuric acid and the oxidizing agent is preferably one having acidity in the strong acid, such as nitric acid, chromic acid, or hydrogen peroxide (column 4, line 66 – column 5, line 6). It is possible to treat the nanotubes at a temperature from room temperature to the boiling point of the acidic mixture (column 5, lines 17-18).

In treating the nanotubes as such, the surface of the nanotubes is modified by oxidation to form a polar functional group such as a carbonyl, carboxyl, nitro, etc. (column 5, lines 28-40 and Table 1). While it is not explicitly stated that only the outer wall of the nanotube is substantially oxidized, it is equivalently stated that the surface of the nanotube is modified with functional groups. Alternatively, it is expected that the outer wall of the nanotube be substantially oxidized because the treatment is performed identically to that of the applicant. Similarly, it is expected that the nanotubes of Shibuta possess the insulating effect claimed by the applicant because no difference is seen between the process of Shibuta and that of the applicant. Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to the applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See *In re Best*, 195 USPQ 430.

Shibuta also teaches that after the treatment, the nanotubes may be filtered, washed, and dispersed in solution, or separated and isolated. This solution may then be used as a coating composition for the formation of an electrically conductive film by coating on a substrate (column 5, lines 41-53 and Examples 1, 4). Shibuta does not explicitly teach that covalent bonding of the nanotube to the substrate occurs due to the oxidation of the nanotube surface.

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However, it is expected that this covalent bonding occur, because no difference is seen between the process of Shibuta and that of the applicant. The oxidized nanotubes of Shibuta are dispersed in water and coated onto a glass substrate in example 1. This same process is taught by the applicants to result in covalent bonding of the nanotubes to the substrate because substrates based on silicon, for example glass, are known to bear hydroxyl groups which will bond with the carboxyl groups on the surface of the nanotubes. Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to the applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See *In re Best*, 195 USPQ 430.

***Claim Rejections - 35 USC § 103***

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibuta.

Shibuta is applied above. It is not explicitly taught that the substrate to which the film of nanotubes is applied be an electronic component, however, it would have been obvious to one of ordinary skill at the time of invention to apply the nanotube film to an electronic component because the potential use of nanotubes in electronics is well known.

Claims 37, 39, 44, 47-48, and 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibuta as applied to claims 36, 40-43, 45-46, and 49-51 above, and further in view of Stephan et al. ("Doping Graphitic and Carbon Nanotube Structures with Boron and Nitrogen").

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Shibuta teaches a process for the treatment of carbon fibrils, or nanotubes, however does not teach the use of carbon nanotubes doped with boron and nitrogen. Stephan et al. discloses the production of multiwalled carbon nanotubes having carbon atoms substitutionally replaced by boron and nitrogen atoms in various amounts. It would have been obvious to one of ordinary skill at the time of invention to perform the process of Shibuta on the nanotubes of Stephan et al., in order to disentangle and disperse the doped nanotubes and also to take advantage of the electronic properties of the BN-doped nanotubes.

Shibuta does not explicitly teach that the substrate to which the film of nanotubes is applied be an electronic component, however, it would have been obvious to one of ordinary skill at the time of invention to apply the nanotube film to an electrical component because the potential use of nanotubes in electrical applications is well known.

### *Conclusion*

The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 2002/0130353 A1, "Controlled Adsorption of Carbon Nanotubes on Chemically Modified Electrode Arrays", "Organizing Single-Walled Carbon Nanotubes on Gold Using a Wet Chemical Self-Assembling Technique", and "Controlled deposition of individual single-walled carbon nanotubes on chemically functionalized templates".

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J. Lish whose telephone number is 571-272-1354. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PL

  
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